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# Determining Economic Benefits of Park Trails: Management Implications

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**EXECUTIVE SUMMARY:** Walking and day hiking on nature trails are popular activities that occur in most park and forest recreation areas, but the public commonly does not recognize trails as developed facilities that require design, construction and maintenance. Trail use impacts, such as tread and surface erosion, vegetation wear and disappearance, and trail widening, are costly repairs that need constant monitoring and maintenance. However, despite the rapid growth of the demand for park and recreational services, government budget cutbacks and public resistance to tax increases occurring over the last several decades have placed parks in a difficult financial situation. Providing park agencies with information regarding economic benefits derived from trail services and facilities will assist them in highlighting the importance of these services, justifying the need for more funds from the government, as well as supporting the implementation of revenue capture policies through user fees. Accordingly, the main focus of this study is to determine the economic values park visitors place on trail facilities and services at a state park using a nonmarket valuation tool. To estimate park visitors' economic benefits of trail use, a contingent valuation method component was incorporated into the questionnaire. The sampling frame for this study included visitors to a state park in South Carolina. Of 543 visitors intercepted, 305 questionnaires were returned, and 248 responses were acceptable for the economic benefit analysis. Using the bivariate probit model, the estimated economic benefits for management and maintenance of park trails are $4.76 and the 95% confidence intervals are between $3.81 and $5.71. Decision makers are challenged with determining the feasibility of park maintenance and sustaining the current conditions of facilities. In particular, hiking is known to be one of the primary uses by individuals visiting parks but the provision of trail services have not kept pace with the management and maintenance needs given declining government budgets. Implications of how the study finding can be used for administration and management decisions are discussed in two different ways (1) fee-based revenue analysis and (2) cost-benefit analysis. Although this study is a case analysis involving trail use at one state park in South Carolina, the methods and results presented could be applicable to trail use at an array of local and state parks to estimate economic benefits of trail resources.

**KEYWORDS:** Park management, trail management, economic benefits, nonmarket valuation, contingent valuation method, outdoor recreation

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Walking for pleasure and day hiking in natural areas are two of the most popular forms of outdoor recreation. In 2000-2001, 83% of the U.S. population 16 years and older participated in walking for pleasure and 33% in day hiking (Cordell, 2004). Not only is a larger percentage of our population participating in these two activities each year, they are also participating more days per year. Approximately 63% and 25% spent over 25 days engaging in walking for pleasure and day hiking, respectively, in 2000-2001 (Cordell). When these two activities are restricted to parks and forest environments, they rank even higher as forest recreation activities. For example, walking for pleasure ranked first and day hiking sixth in millions of recreation activity days in forested settings in 2000-2001 (Cordell).

Most walking for pleasure and day hiking in parks and forested areas occurs on trails and trails are among the most common recreation facilities constructed in parks. Trails provide an excellent way for visitors to explore natural areas, which is one of the most restorative of recreational activities (Kaplan, Kaplan, & Ryan, 1998). While there are many types of trails (Moore & Ross, 1998) that serve many recreational purposes (e.g., walking, hiking, skiing, horseback riding), they all provide desired human benefits including the following (Kaplan et al., p. 89):

- Trails through natural areas bring users into intimate contact with nature, allowing observation, exploration, and restoration. Research has shown that people prefer that trails be compatible with and close to natural surroundings.
- Trails serve as a guide, inviting one to proceed into wildlands, thus enhancing a sense of familiarity and security. In settings that lack trails, it may be less clear that venturing forth is appropriate.
- People who feel guilty taking the time to enjoy nature may value trails through natural settings while walking for health (i.e., exercise), education (i.e., birding), and family (i.e., cohesion/bonding) reasons.

While walking and day hiking on nature trails are popular activities that occur in most park and forest recreation areas, the public commonly does not recognize trails as developed facilities that require design, construction and maintenance. In reality, trails are not just pathways that appear with little invested in construction and maintenance costs. Because fewer miles of new trails are being constructed today, mainly due to decreasing park budgets, it is imperative that existing trails be maintained and trail impacts managed. Trail use impacts, such as tread and surface erosion, vegetation wear and disappearance, and trail widening, are costly repairs that need constant monitoring and maintenance (Hammitt & Cole, 1998). Certain types of trails (e.g., boardwalks) through fragile environments (e.g., marshes) are desired visitor facilities, but are expensive to construct and maintain. Likewise, heavily used trails in fragile environments suffer many use-related impacts and require more maintenance costs. The USDA Forest Service estimates that it costs between $0.50 and $3.50 per linear foot to construct an average trail, depending on whether work is done in-house or by contractors, and can commonly average $20,000 per mile (personal communication, Joe Robles, Recreation Program Manager, USDA Forest Service, Francis Marion & Sumter National Forests).

As indicated above, park resources such as trails not only provide a wide range of recreational values, services, and protection of specific natural and cultural features, but they also explicitly contribute to social and economic well-being. However, despite the rapid growth of the demand for park and recreational services, government budget cutbacks and public resistance to tax increases occurring over the last several decades have placed parks in a difficult financial situation. According to Crompton and Kaczynski (2004), while state budgets increased by 47% in 1990s, the expenditures on parks and recreation only increased by 26% and thus, full-time and part-time park employees declined by 4% and 32%, respectively. As a result, parks and recreation agencies faced with declining budget support, mainly due to the reduced availability of tax funds, have shown increased interest in information on the economic benefits generated by these resources.

Park decision makers are frequently challenged with determining the feasibility of park maintenance and sustaining the current conditions of facilities. They should consider implementing policies that diminish the effects of degradation so recreationists can have the opportunities to experience these same trail services and facilities. Deciding which policies to implement to ensure the proper maintenance and management of trail services and facilities requires policy makers to possess information on the economic benefits generated by these resources. As a result, important questions that all park managers must deal with are, "How much economic benefit do recreationists obtain from the special uses of walking for pleasure and day hiking on trails, and are the benefits accrued from trail use greater than the costs of the maintenance and management of trail services and facilities?"

Assessing the economic value of public goods such as trail services and facilities cannot be accomplished using traditional market-based demand studies due to the absence of market prices. Non-market valuation approaches such as a contingent valuation model are useful for converting social and psychological benefits to economic values for goods such as trail services and facilities not customarily traded in the marketplace (Loomis & Walsh, 1997). Accordingly, the main focus of this study is to determine the economic values park visitors place on trail facilities and services at a state park using the contingent valuation method. Providing park agencies with information regarding economic benefits derived from trail services and facilities will assist them in highlighting the importance of these services, justifying funding requests made to their administration agencies (i.e., cost-benefit analysis), as well as supporting the implementation of revenue capture policies through user fees (i.e., fee-based revenue analysis).

## Economic Benefits Review

Economic benefits, often referred to as net willingness to pay or consumer surplus (CS), indicate the exchange value recreationists place on use of recreational resources such as beaches, historic sites, parks, and trails (Huppert, 1983). Estimating economic benefits that value goods and services is necessary for more reasonable comparisons between costs and benefits in the policy evaluation process. The two nonmarket valuation techniques of 1) revealed preference and 2) stated preference have been popularly used for estimating CS over the last few decades. Revealed preference approaches make use of market decisions to infer values for goods and services not exchanged in the marketplace such as recreational experiences (Ward & Beal, 2000). The travel cost method (TCM) as a revealed preference technique, for example, measures CS derived from the difference between the actual price paid for a good and the latent price that consumers are willing to pay. On the other hand, stated preference approaches such as the contingent valuation method (CVM) formulate a question of "would you be willing to pay for…" to elicit how recreationists would behave given a specific hypothetical situation, based upon the contingency becoming reality (Freeman, 2003). Stated preference methods are particularly beneficial to estimate resource values if new strategies or policies have not been adopted yet but are of interest for future management changes. While the hypothetical nature of the CVM has been a source of skepticism and criticism, well-designed studies are widely accepted to provide reliable and valid estimates in the policy-evaluation process (Mitchell & Carson, 1989). Given this study's focus on use of park trails, the CVM approach is appropriate due to a lack of available revealed preference data on recreationists' trip decisions for trail use.

There have been a few studies that sought to estimate the benefits of trails. Siderelis and Moore (1995) used the travel cost method to estimate the benefits of rail trails in Iowa, Florida, and California and reported the recreation benefits ranging from $7.39 to $52.09 per trip.[1] Bennett, Tranter, and Blaney (2003) estimated economic benefits of $2.49 per trip[2] accrued from access to national trails in the United Kingdom using a contingent valuation method. Betz, Bergstrom and Bowker (2003) developed a hybrid model of CVM and TCM to estimate a consumer surplus of $22.34 per trip in a potential rail trail site in north-east Georgia. Finally, Bowker, Bergstrom, and Gill (2007) examined an economic value of local rail trail trips and found that per trip values were $24.96 per trip in south-west Virginia.

However, all of the studies focused mainly on measuring economic benefits of trail development or provision for local and regional tourism development. This study differs from the aforementioned studies in two major ways. First, the study is to quantify users' willingness to pay for the current level of maintenance and management of trail services and facilities. In other words, welfare measure is the equivalent variation that is expressed as the maximum amount of money a user is willing to pay to avoid a decline in recreational services (Haab & McConnell, 2002; Huhtala, 2004). Second, given the multitude of park trails in South Carolina and the rest of the U.S. with waning budget support, the study methods should be more easily generalizable to other state parking settings for use in developing meaningful management decisions.

To fill the void concerning useful management information about park trails, it is imperative to provide managers with accurate information about economic benefits. This information better informs decisions about the maintenance and management of these facilities. The purpose of this paper is to attempt to answer these questions for trails using a popular South Carolina State Park as a study site.

## Method

*Study Site*

Table Rock State Park (TRSP) is located at the edge of the Appalachian Mountains in the northern section of South Carolina. The park, built in 1930s by the Civilian Conservation Corps as part of the New Deal Program, has been one of South Carolina's most popular state parks. The park is a South Carolina Heritage Trust Site and is listed on the National Register of Historic Places. TRSP totals over 3,000 acres of land and includes two lakes, a campground with 100 sites, 14 mountain cabins, four picnic shelters, and meeting facilities for various recreation activities. The park provides several hiking trails that encourage recreationists to engage in hiking and walking opportunities. While there are some easy trails available for hikers with families, TRSP also includes more challenging trails that lead to higher elevations in the park's backcountry (South Carolina State Park, 2007).

*Sample*

The sampling frame for this study was TRSP visitors. The population list of TRSP visitors was not available and, thus, a purposive sampling strategy of on-site and mail surveys was used. Visitors were intercepted and asked to fill out the questionnaire on site during their visit to TRSP. When they were reluctant to fill out the on-site questionnaire, alternatively, visitors' names and addresses were collected for a follow-up mail survey to minimize their refusals. Due to concerns about heterogeneous preferences for park management over different time periods (i.e., seasonal variability), on-site sampling was conducted during summer, fall, and winter (June to December of 2006). All mail questionnaires, including three mailings and a postcard, were sent by first-class mail using a modified Dillman Total Design Survey Method (2007). Finally, mail questionnaires were sent in three different waves to minimize the recall bias, with the first mailings sent in September, October, and December, 2006.

*Contingent Valuation Method*

To estimate park visitors' net willingness to pay for consuming non-tradable public goods or services such as the management of park trails, the contingent valuation method (CVM) component was incorporated into the questionnaire. The single-bounded (SB) CVM has been commonly used over the last two decades (e.g., Sellar, Chavas, & Stoll, 1986; Stoll & Ditton, 2006). The SB-CVM requires respondents to choose a "Yes" or "No" answer to a dichotomous (or closed-ended) contingent valuation question. The key advantage of the SB-CVM is that respondents' choice of "take it or leave it" is similar to the price taking behavior that individuals face in market transactions (Loomis & Walsh, 1997). Despite its simplicity in implementation, however, the SB-CVM has been criticized in that researchers can have limited information of whether the WTP is above the proposed bid amount threshold when a respondent answers "Yes" or WTP is below the proposed bid amount threshold when a respondent answers "No." As a result, its WTP estimates can be inefficient, and the SB-CVM requires a large number of respondents to increase the precision of the WTP estimates (Cameron & Huppert, 1991; Hanemann, Loomis, & Kanninen, 1991).

As an effective alternative, the double-bounded (DB) CVM has been used with the follow-up dichotomous choice question for a second answer to obtain more information. If a respondent's answer is "yes" to the first dichotomous choice question for a bid amount of $X, the respondent is asked to be willing to pay a bid amount of $X+$Y in the follow-up question. If a respondent answers "no," the follow-up question is provided to determine whether the respondent is willing to pay a bid amount of $X-$Y. A sequence of questions may increase the complexity of the model analysis, but the insertion of an additional question helps to produce more precise WTP estimates by obtaining more information from each respondent (Cameron & Huppert, 1991; Haab & McConnell, 2002).

To estimate recreationists' economic values of the maintenance and management of park trails, the DB-CVM questions were inserted in the mail questionnaire. To develop realistic valuation scenarios, we met with park managers to understand their interests in and concerns about the management of park trails. User fees were selected as a payment vehicle because they have been adopted in numerous parks and protected areas. The exact wording of the initial question was as follows:

"Currently, South Carolina State Park Service (SCSPS) is utilizing federal and state grants to provide the maintenance and management of trail services and facilities at Table Rock State Park. The funds provided by this grant program are limited in their capacity to fulfill the requirements of park managers. In order to maintain the current trail conditions, SCSPS requires an additional source of revenue. One viable option for the maintenance and management of the trails is a trail user fee, in addition to the park's entrance fee. If this user fee would allow Table Rock State Park to provide equal or better trail services and facilities for park visitors, would you be willing to pay a trail user fee of $ _________?"

The follow-up question was as follows:

"If this user fee would allow Table Rock State Park to provide equal or better trail services and facilities for park visitors, would you be willing to pay a trail user fee of $ _________?"

The ten initial bid values ranging from $1 to $10 were pre-selected based on a review of related literature. The second bid values ranging from $0.5 to $5 were followed if the answer to the first question was "no" and those from $2 to $20 were inserted if the answer to the first one was "yes." For respondents who placed zero WTP in both DB-CVM questions, a question was further asked to examine protest behavior. An on-site pilot test was conducted to check clarity of the survey instrument including DB-CVM questions and bid designs.

*Analysis Approach*

The economic WTP function model is represented as $WTP_i = \chi_i\beta + \varepsilon_i$ where *i* indicates the first and second answers, $\beta$ is a vector of coefficients, $\chi_i$ is a vector of explanatory variables, and $\varepsilon_i$ is the error term. Given DB-CVM questions, each respondent is responsible for answering two dichotomous questions, producing four answering sets based on the two sequential bid amounts, $t_i$ : a) both answers are YES (YES-YES; YY); b) both answers are NO (NO-NO; NN); c) NO is followed by YES (NO-YES; NY); and YES is followed by NO (YES-NO; YN). The general form of the DB-CVM can be formulated as follows:

$t_1 \leq$ WTP $\leq t_2$ for YES-NO responses; $t_1 >$WTP $> t_2$ for NO-YES responses; WTP $> t_2$ for YES-YES responses; and WTP $< t_2$ for NO-NO responses.

To interpret these outcomes, consider a response sequence of YES-NO. The WTP is greater than the initial bid, $t_1$, as indicated by the YES response, but less than the follow-up bid, $t_2$ as indicated by the NO response. As another response sequence of NO-NO, the respondent's WTP is less than the smallest bid amount, $t_2$. The other two outcomes have analogous interpretations. In brief, the second DB-CVM question allows researchers to identify an upper and a lower bound of the WTP for the YES-NO and NO-YES responses and to sharpen an upper and a lower bound for the YES-YES and NO-NO responses, respectively.

Because the error component in the WTP function is unobservable, only probability statements about the WTP, therefore, can be made. Let $WTP_{ij}$ denote the WTP for respondent j and bid i. The likelihood function of the four possible sets is:

$$L(WTP/t) = \Pr[(WTP_1 + \varepsilon_1 \geq t_1, WTP_2 = \varepsilon_2 < t_2)^{YN} \text{ x } \Pr[(WTP_1 + \varepsilon_1 > t_1, WTP = \varepsilon_2 > t_2)^{YY}$$
$$\text{x } \Pr[(WTP_1 + \varepsilon_1 < t_1, WTP_2 + \varepsilon_2 < t_2)^{NN} \text{ x } \Pr[(WTP_1 + \varepsilon_1 < t_1, WTP_2 + \varepsilon_2 > t_2)^{NY}$$

where Pr is the probability of each set. Assuming the errors terms are normally distributed with mean zero and respective variances $\sigma_1^2$ and $\sigma_2^2$, $WTP_1$ and $WTP_2$ are a bivariate normal distribution with correlation coefficient ρ (adapted from Haab and McConnell [2002] and Hanemann et al. [1991]).

In the WTP model, a set of important variables of individual characteristics (i.e., $\chi_i$ ) are included in order to "gain information on the validity and reliability of the contingent valuation method and to extrapolate sample responses to more general populations" (Haab & McConnell, 2002, p.23). Consequently, the following explanatory variables were included: proposed bid amount (BID), a recreationist's age (AGE), level of education (EDU), level of satisfaction with the quality of trails (QTRAIL), and level of satisfaction with the value for the use fee (FVALUE) and effect of gasoline price on travel decisions for outdoor recreation (GAS). Further, a dummy variable of whether recreationists visited TRSP for hiking as the main reason or not (HIKING) was inserted to test the differences in WTP between the hiking group and non-hiking group. Given the reasonable assumption that the marginal utility of income is constant in a linear utility function, income drops from the WTP model (Haab & McConnell, 2002). The detailed definitions of the variables are represented in Table 1.

**Table 1. Variable Names and Definitions of Variables Used in the Analysis.**

| Variable Names | Description | Hypothesized effects |
|---|---|---|
| HIKING | Dummy variable for hikers (= 1 if the main reason to visit TRSP was hiking, 0 otherwise) | + |
| BID | Proposed bid amount in dollars | - |
| AGE | Visitor's age | + |
| EDU | Level of education (1 = more than college graduate, 0 = some college/technical school or less education) | + |
| QTRAIL | Level of satisfaction with the quality of trails (coded 0 to 1: 0 = not at all, slightly, and moderately satisfied, 1 = very and extremely satisfied) | + |
| FVALUE | Level of satisfaction with the value for the user fee (coded 1 to 5: 1 = not at all satisfied, 5 = extremely satisfied) | - |
| GAS | Effect of the increase in gasoline price on travel decisions for outdoor recreation (coded 1 to 5: 1 = no effect, 5 = major effect) | - |

Hypothesized effects of the explanatory variables on the probability of accepting a bid are as follows. As per economic theory, the higher the price, the less likely a recreationist is to purchase a service provided with all other factors remaining the same (i.e., *ceteris paribus*). Thus, the higher the bid amount, the less likely a visitor continues to use park trails. A recreationist's individual characteristics as additional determinants of trip demand (e.g., age, education, satisfaction with their trips) are also expected to have an impact on WTP. Typically, an older recreationist with more education is likely to be willing to pay higher trip costs. The more satisfied a visitor is with the quality of trails, the higher the probability (s)he will accept the bid amount. Likewise, a recreationist who is more satisfied with the value of the user fees are more likely to accept proposed bid amounts. The effect of an increase in the average gasoline price on recent decisions for outdoor recreation is negatively related to the probability of a "Yes" response. Finally, a recreationist who visited TRSP for hiking as the main reason is more likely to accept proposed bid amounts.

## Results

*Descriptive Statistics*

Of 305 questionnaires collected, 50 on-site surveys and 255 mail surveys were completed and returned. For the on-site surveys, a total of 68 visitors were contacted, thus yielding a 74% return rate. In addition, of 475 visitors intercepted on site and mailed a questionnaire, 31 surveys were returned as undeliverable. The effective response rate for the mail surveys after deleting these non-deliverables was 68.7%. Caution should be exercised, however, when generalizing survey results to the population level without a check on non-response.

Of these 305 returned responses, 57 were excluded for further analyses due to incomplete responses to the CVM questions and/or protest against the method of payment in the follow-up question. For the explanatory variables included, a multiple imputation method as an effective approach to take into account missing responses was used to reduce biases that may occur when observations with missing responses are entirely deleted (see more of a multiple imputation method from Penn [2007] and Vriens and Melton [2002]). As a result, 248 responses were kept for the final WTP analysis. The majority of respondents (89%) were out-of-county visitors and most of the respondents (61%) had visited TRSP previously. Over half of respondents (52%) had a household income over $70,000. The average age of respondents was almost 45 years, and over half of respondents were college graduates (38%) or post graduates (25%). When respondents were asked their level of satisfaction with the quality of trails and the value for the user fee, most respondents (91% and 88%, respectively) were either very satisfied or extremely satisfied. Finally, more than half of respondents (57%) indicated the increase in gasoline prices had a neutral, moderate, or major effect on their decisions to travel for outdoor recreation while 43% of respondents indicated no or minor impact on their trip decisions. Descriptive statistics for the explanatory variables used in the model estimation are reported in Table 2.

**Table 2. Descriptive Statistics of TRSP Visitors for Variables Used in the Analysis.**

| | Respondents | |
|---|---|---|
| **Variable** | **Mean** | **Standard Deviation** |
| HIKING | 0.62 | 0.5 |
| AGE | 44.27 | 13.2 |
| EDU | 0.55 | 0.5 |
| QTRAIL | 4.16 | 0.7 |
| FVALUE | 4.32 | 0.8 |
| GAS | 2.70 | 1.3 |

*Estimation Results*

Estimation results of the bivariate probit model are presented in Table 3. All model estimation was performed using STATA 10.0. For simplicity, the parameter estimates (i.e., coefficients) of the first dichotomous choice question are reported here based on superior estimation results (contact the first author for the complete analyses). The explanatory power of the model measured with McFadden's $\rho^2$ was 0.09.

**Table 3. Results of the Bivariate Probit Model.**

| Variable | Coefficient | *Std. err* | t-value |
|---|---|---|---|
| Intercept | 0.4095 | 0.759 | 0.54 |
| HIKING | -0.2779 | 0.182 | -1.53 |
| BID | -0.1967**[a] | 0.035 | -5.60 |
| AGE | 0.0042 | 0.007 | 0.60 |
| EDU | -0.2396 | 0.182 | -1.31 |
| QTRAIL | 0.2862** | 0.145 | 1.98 |
| FVALUE | -0.0134 | 0.112 | -0.12 |
| GAS | -0.1748** | 0.067 | -2.63 |
| Log-Likelihood | -304.2 | | |
| McFadden $\rho^2$ | 0.087 | | |
| | Lower Bound CI[b] | Mean WTP | Upper Bound CI[b] |
| WTP | 3.81 | 4.76 | 5.71 |

[a] *Significance levels of .05 are represented by **.*

[b] *The confidence interval was calculated from the delta method.*

In general, parameter estimates were consistent with prior expectations except for HIKING and EDU. These explanatory variables, however, were not significant. Nevertheless, they were further included in the WTP assessment to maintain theoretical consistency (i.e., the internal validity of the WTP estimation). The significant and negative coefficients associated with the BID variable indicates that visitors were less willing to pay (i.e., to respond "YES") as the proposed bid amount increased. The discrete responses to double-bounded questions indicate that while 82% and 79% of respondents responded "Yes" (i.e., willing to pay) to the low bid values of \$0.5 and \$1, less than 25% would be willing to pay the higher bid values of \$7 and \$10. The estimated parameter for the dummy variable, HIKING, was not statistically significant at 0.1, implying that there were no group differences in WTP between the hiking and non-hiking groups. The significant positive coefficient of QTRAIL indicates that recreationists who were satisfied with the quality of trails were more likely to respond "YES," indicating a higher WTP. Likewise, the negative coefficient associated with GAS indicates the inverse relationship between the effect of the increase in gasoline price on travel decisions for outdoor recreation and the probability of accepting a higher bid. Finally, the rest of the explanatory variables (AGE, EDU, and FVALUE) have no impact on people's WTP as these coefficients are not statistically significant.

Once the bivariate probit model was estimated, mean WTP was calculated using $WTP = -(\chi\beta)/\beta_{fee}$ where $\beta_{fee}$ is the parameter estimate of the bid amount (Table 3). Assuming the mean values for the explanatory variables besides BID, the estimated WTP for management and maintenance of park trails is \$4.76[3]. Thus, when the values are understood as economic benefits accrued from their park trail experiences, average park visitors were willing to pay \$4.76 (i.e., benefit gain worth \$4.76). To examine the variability of WTP estimates more rigorously, development of confidence intervals is beneficial (Park, Loomis, & Creel, 1991). The delta method (Greene, 2002) was used to estimate the standard error for the construction of confidence intervals of a WTP measure. The 95% confidence intervals constructed are between \$3.81 and \$5.71 (Table 3).

## Discussion and Conclusion

When economic benefits of facilities like trails cannot be directly measured due to the nature of public goods, non-market valuation tools can be valuable in converting those benefits into monetary dimensions. Such valuation studies can serve as a decision-making tool for managers to systematically compare the pros and cons of new policies and management options of interest. In large part, the study findings can be used for administration and management decisions in two different ways: (1) fee-based revenue analysis and (2) cost-benefit analysis.

First, information on WTP estimates can be used to evaluate the likelihood of success of a fee system as a pricing decision tool to supplement diminishing funding sources (Adams, Bergland, Musser, Johnson, & Musser, 1989). The park revenue is assessed after taking into account the effects of various fee (or WTP) increases in terms of changes in park revenue (Sutton, Stoll, & Ditton, 2001). There exists a different view that other measures, such as an appropriate fee, should be used instead of WTP due to concerns about equity and fairness (e.g., Richer & Christensen, 1999). Nonetheless, the concept of WTP has been proven to be a valid measure of welfare estimates (e.g., Bishop & Heberlein, 1979; Lee & Mjelde, 2007) and numerous studies have used WTP to provide sound information upon which to implement funding mechanisms such as charging or increasing user fees (e,g., Betz, Bergstrom, & Bowker, 2003; Sutton, Stoll, & Ditton, 2001; Teasley, Bergstrom, & Cordell, 1994). For our study, the fee-based revenue analysis was performed using varying bid amounts as a trail user fee, in addition to the current park entrance fee of $2 per person. Increasing a user fee may lower the number of visitors or number of trips for repeated visitors but demand response is not likely to be as elastic when a fee system is already in use (Teasley et al., 1994), As a result, assuming (in a practical sense) the current number of visitors to TRSP based on the best available information, the following equation is used to estimate the total revenue generated: Revenue = User Fee × Percent of visitors who are willing to pay a fee × Total number of visitors.

The results in Table 4 shows that at a trail use fee of $2 (in addition to the existing entrance fee), 145,708 visitors (61.8% × 235,774) are willing to pay a user fee, resulting in additional total park revenue of $291,502. The additional park revenue is likely maximized at a user fee of $5, amounting to $640,690.

**Table 4. Estimated Revenue-Capture Potential for a Trail User Fee.**

| Bid amount | Percent of visitors who are willing to pay user fee | Total number of visitors visitors to the park | Aggregate revenue potential |
|---|---|---|---|
| $0.5 | 82.14% | 235,774 | $96,836 |
| $1 | 78.85% | 235,774 | $185,899 |
| $1.5 | 60.61% | 235,774 | $214,340 |
| $2 | 61.82% | 235,774 | $291,502 |
| $2.5 | 75.00% | 235,774 | $442,076 |
| $3 | 70.83% | 235,774 | $501,020 |
| $4 | 54.55% | 235,774 | $514,416 |
| $5 | 54.35% | 235,774 | $640,690 |
| $7 | 24.00% | 235,774 | $396,100 |
| $10 | 20.59% | 235,774 | $485,417 |

Limited resources continue to lead the call for economic efficiency, which requires maximizing public welfare while allocating resources prudently. This has been used as one of the main principles in the management decision-making process (Bowker, Bergstrom, & Gill, 2007). The user-pay/ user-benefit approach has been drawing more attention and helps achieve this goal. As with many contemporary government services, it suggests a move toward the beneficiary paying a higher percentage of service costs. As public appropriations to park operations wane, a user fee-based approach should be a viable means to secure the costs needed. Consequently, there has been greater dependence of agency budgets on user-generated revenue sources (e.g., park entrance fees, special use fees, fishing license fees, and excise taxes imposed on recreational equipment) (Bowker, Cordell, & Johnson, 1999).

The dependence on user fees, however, inevitably invokes concerns about equity and fairness because they may displace certain segments of recreationists, such as lower income individuals (e.g., Kim, Shaw, & Woodward, 2007; More & Stevens, 2000). The goal of this paper was not to focus on whether a fee-based revenue approach is appropriate or not, but a separate analysis, not reported here, has been conducted (contact the first author for more information) and provides some insight into whether income inequality is related to visitors' willingness to pay for trail use. The respondents were segmented into three different groups: low income (less than $29,999), medium income (between $30,000 and $79,999) and high-income recreationists ($80,000 and above). Although the low-income group was intentionally excluded in the analysis due to a small sample size (less than 25), the estimated WTP of the medium-income group was $5.44, and that of the high-income group was $4.37. The results indicate that increased fees may not displace different income user groups disproportionately, and the equity and fairness concerns are seemingly minimal.

Cost-benefit analysis is another policy evaluation tool for making optimal decisions of a proposed public project. The basic principle is to support any projects if the benefits are greater than the costs and/or to choose the one with the greatest positive net benefits among competing projects (Loomis & Walsh, 1997). Relatively, park managers more easily obtain information on maintenance and operation costs incurred for park trail services and, thus, provision of aggregate costs and benefits should be viable and useful in making decisions. Accordingly, total WTP (i.e., economic benefits) at the population level is calculated using the total number of park visitors to TRSP (South Carolina Department of Parks, Recreation and Tourism, 2005). Multiplied by the net WTP of $4.76, the total visitors of 235,774 to TRSP likely gained economic benefits of over 1.1 million dollars from the management and maintenance of park trails. Using the confidence interval in Table 3, the estimated benefits range between $898,869 and $1,346,590. These benefit amounts were obtained by assuming that the total number of visitors in 2005 did not change in the following years.

The total economic benefits, however, are relatively closer to the conservative estimates and are possibly higher with the following factors. First, much of the worth of recreation resources and the activities they provide consists of use and non-use values. The study focus here was only on use value derived from the use of park trails. Consequently, a non-use value such as existence and bequest values was not included in the total benefits estimated here. Second, the effect of record-high gas prices probably acts as a pull factor to nearby parks for recreationists who used to take trips to distant locales, and it should lead to a shift toward recreational trips to destinations, such as local and state parks (personal communication with Phillip Gaines, Director of South Carolina Park Service, 2008). For example, when the study was conducted in May, 2006, the average price for a gallon of regular gasoline in South Carolina was $2.78, but it was over $3.90 in summer, 2008 (American Automobile Association, 2008).

Despite its importance as a policy and management assessment tool, there has been a paucity of economic benefit research on park trails, yet trails are one of the major use facilities of parks. Trend studies project increasing trail use, as walking for pleasure and day hiking are popular activities. Although this study is a case analysis involving trail use at one state park in South Carolina, the methods presented could be applicable to trail use at a diverse array of local and state parks as a template to estimate the economic benefits of trail resources. However, more research will be beneficial to help improve our understanding of economic resource values. Future research that duplicates this analysis in other parks and on other trails in South Carolina will provide complementary information. In addition, research concerning the economic benefits generated by trail services and facilities segmented by different user groups, based on recreation specialization (e.g., Oh, Ditton, Anderson, Scott, & Stoll, 2005) and place attachment (e.g., Hammitt, Backlund, & Bixler, 2004), would provide policy decision makers and park managers with important information in management decisions. As Driver (1985) indicated, the separation of user groups with different motivations and behaviors can help differentiate "recreation products" with clientele-modified characteristics.

Decision makers are challenged with determining the feasibility of park maintenance and sustaining the current conditions of facilities. In particular, hiking is known to be one of the primary uses by individuals visiting parks but the provision of trail services have not kept pace with the management and maintenance needs given declining government budgets. Providing accurate information of economic values requires stakeholders to acknowledge the increasing strain on public services and justify the expenditures and investment in trail operations, maintenance and improvements under limited budgets.

## Footnotes

[1]All of the estimated values were converted into 2006 values using the consumer price index. Where multiple values were provided, the most conservative value was used.

[2]Estimated WTP was converted to U.S. dollars using the U.S./U.K. Foreign Exchange Rate in 1996.

[3]For the comparison purpose, the independent probit model with the assumption of zero correlation coefficient between the errors for the two WTP functions was also used to calculate WTP as an alternative. The mean WTP was estimated to be $4.3 and the 95% confidence interval was between $3.4 and $5.1. Due to potential concerns about endogeneity, the bivariate probit model without independent variables was also estimated. The mean WTP calculated was $4.8 and the 95% confidence interval was between $3.7 and $5.3.

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